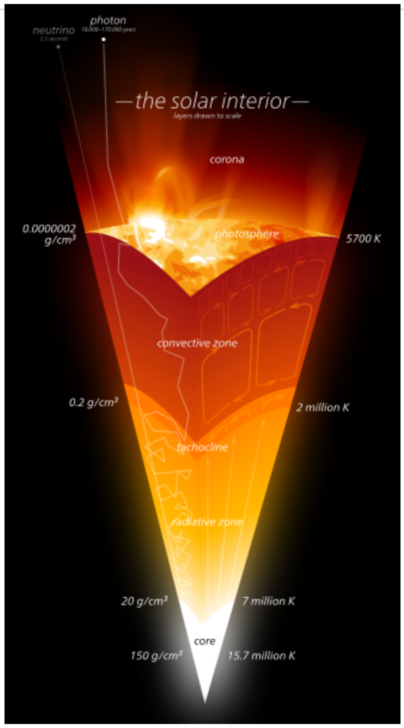
13.1: The Solar Interior



The solar interior.

https://commons.wikimedia.org/wiki/F...r_interior.svg

Temperatures at the **core** of the Sun reach 15 million K. The heat is generated by the fusion of hydrogen into helium. The core extends to a radius of about 200,000 km.

Between 200,000 km and 500,000 km from the center, energy from the core is transported primarily through radiation. The **radiation zone** has a temperature of about 7 million K at its closest to the core to about 2 million K at its outer edge. At these temperatures, the plasma is transparent to the radiation from the core, so radiation is the primary means of energy transport. Despite traveling at the speed of light, photons bounce around inside the radiation zone, colliding from one atom to another like pinballs. Because of this meandering path, it can take millions of years for a single photon to travel through to radiation zone to reach convection zone above.

The **convection zone** extends from 500,000 km to 700,000 from the center of the Sun. With a temperature of about 2 million K, the plasma in this zone absorbs heat from the core and then bubbles upward, transferring the heat to the surface through a series of convection cells. The gas heats up, expands and rises to a higher level, where it transfers its heat, cools, and sinks back down to pick up more heat. The visible top layer of the convection zone is granulated, with areas of upwelling material surrounded by areas of sinking material. Doppler shifts of spectral lines indicate complex patterns of rising and falling currents transporting feature to photosphere. Helioseismology, the study of surface fluctuations of the Sun's surface, can enable scientist to map out how variations in the Sun's surface can affect solar weather.